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I, Ho Jin PARK, a citizen of the Republic of Korea and a staff member of Y.H.KIM INTERNATIONAL PATENT & LAW OFFICE specializing in "Electronics", do hereby declare that:

(1) I am conversant with the English and Korean languages and a competent translator thereof.

(2) To the best of my knowledge and belief, the following is a true and correct translation of the Priority Document (No. P98-18883) in the Korean language already filed with Korean Intellectual Property Office on May 25, 1998.

Signed this 11th day of October, 2002

Ho Jin PARK

PATENT APPLICATION

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TITLE OF THE INVENTION:

A STRUCTURE OF A PAD IN A LIQUID CRYSTAL DISPLAY DEVICE AND A METHOD FOR MANUFACTURING THEREOF

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SPECIFICATION

[Title of the invention]

A STRUCTURE OF A PAD IN A LIQUID CRYSTAL DISPLAY AND A METHOD FOR MANUFACTURING THEREOF

[Brief description of the drawings]

Fig. 1 is a perspective view illustrating a conventional liquid crystal display device.

Fig. 2 is a cross-sectional view illustrating the conventional liquid crystal display device.

Fig. 3 is a cross-sectional view illustrating how a pad is shorted to the common electrode by a remaining conductive material in the conventional liquid crystal display device.

Fig. 4 show cross-sectional views illustrating a manufacturing process for a liquid crystal display device according to the present invention.

Detailed descriptions of the reference number

1a, 101a: first transparent substrate
1b, 101b: second transparent substrate

3, 103: color filter panel	5, 105: active panel
7, 107: color filter	8, 108: common electrode
9, 109: black matrix	11, 111: gate electrode
13, 113: gate line	15, 115: gate pad
17, 117: gate insulating layer	
21, 121: source electrode	23, 123: source line
25, 125: source pad	31, 131: drain electrode
33, 133: semiconductor layer	37, 137: passivation layer
47, 147: pixel electrode	57, 157: gate pad terminal

67, 167: source pad terminal

77: remaining conductive material

10, 110: liquid crystal material

81, 181: sealant

[Detailed description of the invention]

[Object of the invention]

[Technical field including the invention and prior art therein]

This invention relates to a liquid crystal display device (LCD) and a method for manufacturing thereof. More specifically, the present invention relates to a structure of an LCD in which a side edge of the common electrode formed on the entire surface of an upper substrate and a data pad or gate pad formed on the lower substrate in the LCD are not overlapped, and also a method for manufacturing such an LCD.

The CRT (Cathode Ray Tube), a widely used display device, is being replaced by the thin flat panel display device because the thin flat panel display device is thinner and lighter than the CRT so it can be located any place. Research has been focused on the development of liquid crystal display devices because of their high resolution and fast response time which is suitable for displaying motion picture images.

A liquid crystal display device works by using polarization and optical anisotropy of a liquid crystal material. By controlling the orientation of rod-shaped liquid crystal molecules through a polarization technique, transmission and interception of a light through the liquid crystal are achieved because of the anisotropy of the liquid crystal material. This principle is used in the

liquid crystal display device. Active matrix liquid crystal displays (AMLCDs) having TFTs arranged in a matrix pattern and pixel electrodes connected to the TFTs provide high quality images and are widely used. The detailed structure of a liquid crystal panel constituting a conventional LCD is now described with reference to Fig. 1 which shows the perspective view of the conventional LCD and Fig. 2 which shows a cross-sectional view of the conventional LCD taken from line II -II in Fig. 1.

The liquid crystal panel includes two panels 3, 5 each having several elements and arranged to face each other with a liquid crystal material 10 located between the two panels. Several elements implementing colors are provided the first panel, which is referred to as a color filter panel 3. The color filter panel 3 includes a sequential arrangement of red, blue and green color filters 7 on a first transparent substrate 1a at pixel positions arranged in a matrix pattern. Among these color filters 7, black matrixes 9 are arranged in a lattice pattern. The black matrixes 9 prevent mixing of adjacent colors. A common electrode 8 is located on the color filters 7. The common electrode 8 serves as one electrode forming the electric field to be applied the liquid crystal.

The second panel, which is referred to as an active panel 5, includes switching elements and lines generating electric field for driving the liquid crystal. The active panel 5 includes pixel electrodes 47 on a second transparent substrate 1b at pixel positions arranged in a matrix pattern. The pixel electrode 47 opposite to the common electrode 8 on the color filter panel 3 serves as the other electrode forming the electric field to be applied to the liquid crystal material 10. Scan bus lines

13 are arranged along the column direction of the pixel electrodes 47, and data bus lines 23 are arranged along the row direction of the pixel electrodes 47. In the AMLCD, at a corner of a pixel electrode 47, a TFT for applying the electric field signal to the pixel electrode 47 is formed. In the AMLCD, a gate electrode 11 of the TFT is connected to the scan bus line 13 which is also referred to as a gate line. A source electrode 21 is connected to the data bus line 23 which is also referred to as a source line. A drain electrode 31 of the TFT is connected to the pixel electrode 47. A semiconductor layer 33 is disposed between the source electrode 21 and the drain electrode 31 of the TFT. The source electrode 21 and the semiconductor layer 33, and the drain electrode 31 and the semiconductor layer 33 are ohmic contacted, respectively. Additionally, a gate pad 25 is formed at the end portion of each gate line 13 and a source pad 25 is formed at the end portion of the source line 23. The gate pad 15 and the source pad 25 are terminals supplied with a signal voltage from an exterior circuit respectively.

As a signal voltage supplied with the gate pad 15 is applied to the gate electrode 11 through the gate line 13, the semiconductor layer 33 is activated, and then the source electrode 21 and the drain electrode 31 of the TFT are electrically connected so that the electrical picture data applied to the source pad 25 is sent to the drain electrode 27 through the source line 23 and the source electrode 21. Otherwise, no signal voltage is applied to the gate pad 15, then the source electrode 21 and the drain electrode 31 of the TFT are electrically isolated. Accordingly, controlling the signal voltage of the gate electrode 11 determines whether the picture data is applied

to the drain electrode or not. That is, the TFT 19 acts as a switching element. A gate insulating layer 17 is inserted between the layer including the gate line 13 and the layer including the source line 23 to isolate them electrically. Further, a passivation layer 37 is formed on the layer including the source line 23 to protect the elements.

The color filter panel 3 and the active panel 5 are bonded together so as to face each other and so as to be spaced apart by a certain distance which is referred to as a cell gap. Liquid crystal material 10 fills the cell gap. The edges of the bonded panels are sealed with a sealant 81 such as an epoxy to prevent the liquid crystal material 10 from leaking, so that a liquid crystal panel of the LCD is completed. Generally, after the liquid crystal material 10 is injected between the color filter panel 3 and the active panel 5 which is joined together by the sealant 81, portions of the color filter panel 3 covering the gate pad 15 and the source pad 25 are removed in order to expose the pads 15 and 25 for connection to outputs of the exterior circuit. (See Figs. 1 and 2.)

In the conventional LCD panel mentioned above, the pad portions of the LCD panel in which the common electrode 8 is formed on the entire surface of the color filter 7 are arranged as shown as in Fig. 3. In this case, after the pad covering portions of the color filter panel 5 is removed by mechanical cutting, a remaining conductive material 77 which is left over from cutting of the ITO layer of the color filter panel 5 may electrically connect the common electrode 8 and the pads 15 and/or 25 as shown in Fig. 3. In that case, the LCD does not work properly.

[Technical subject matter to be solved by the invention]

The object of present invention is to provide a method which defects caused by any remaining conductive material generated after cutting portions of a color filter panel covering pads of a active panel may be prevented, in a manufacturing process of a liquid crystal display device which a color filter panel on the entire surface of which a conductive material is deposited and an active panel including thin film transistors and pads are joined together, with a liquid crystal material between two panels, and a structure of the liquid crystal display device manufactured by the same method.

The other object of the present invention is to provide a method for manufacturing a liquid crystal display device, including a color filter panel on the entire surface of which a common electrode of conductive material is formed, that electrical short between the common electrode and pads due to conductive foreign substance may be prevented.

[Configuration and operation of the invention]

To this end, the present invention provides a liquid crystal panel of a liquid crystal display panel having a gate pad and a source pad which are arranged so as to be spaced a predetermined distance D from an edge of a color filter panel.

The method for manufacturing the liquid crystal display device according to the present invention comprises the steps of forming a first panel having a common electrode on the entire surface of the first panel, forming a second panel having a gate pad and a source pad, joining the first panel and the second panel together and inserting a liquid crystal material therebetween, and cutting

portions of the first panel spatially covering the gate pad and the source pad so that the gate pad and the source pad are space apart from the cut edge of the first panel by a predetermined distance D.

The manufacturing method of the liquid crystal display device according to the present invention will be now described more detail, by way of example, with reference to the accompanying drawings.

On a first transparent substrate 101a, a plurality of color filters 107 including red, green and blue resins are formed at pixel positions arranged in a matrix pattern, and a black matrix 109 is disposed between each of the color filters 107. A common electrode 108 is formed by depositing an ITO (Indium Tin Oxide) on the entire surface of the substrate 101a having the color filter 107 and the black matrix 109. As a result, a color filter panel is completed. (See Fig. 4a.)

On a second transparent substrate 101b, a thin film transistor having a gate electrode 111, a semiconductor layer 133, a source electrode 121 and a drain electrode 131 is provided, and a pixel electrode 147 which is connected to the thin film transistor is disposed at the pixel and is aligned with the color filter 107. A gate line 113 connecting the gate electrodes 111 and a source line 123 connecting the source electrode 121 are arranged in a lattice pattern. At end portions of the gate line 113 and the source line 123, a gate pad 115 and a source pad 125 are provided, respectively. The gate electrode 111 and the gate line 113 are covered by a gate insulating layer 117, and the source electrode 121, the source line 123 and the drain electrode 131 are covered by a passivation layer 137. As a result, an active panel 105 is completed. Herein, the

gate pad 115 and the source pad 125 are sufficiently spaced apart from the edge of the color filter panel 103. (See Fig. 4b.)

Using a sealant 181, the color filter panel 103 and the active panel 105 are joined together so that they are spaced from each other by a certain distance. A liquid crystal material 110 is injected into the space between the joined color filter panel 103 and active panel 105. (See Fig. 4c.)

Then, portions of the color filter panel 103 are removed so that the gate pad 115 and the source pad 125 on the active panel 105 may be exposed. At this time, the gate pad 115 and the source pad 125 are spaced apart from the edge of the color filter panel 103 by a predetermined distance D. In other words, the gate pad 115 and the source pad 125 are fully exposed without being covered by any portion of the color filter panel 103. (See Fig. 4d.)

[Effect of the invention]

The present invention relates to a structure of a pad portion in a liquid crystal display device having a common electrode and a method for manufacturing the same. In the present invention, pads disposed on an active panel are space apart from the edge of a color filter panel by a predetermined distance. Accordingly, the gate pad and the source pad are not overlapped spatially the common electrode of the color filter panel. Therefore, there is no electric short caused by a remaining conductive material disposed between the pads and the common electrode after cutting the color filter panel.

[What is claimed is]

1. A method for manufacturing a liquid crystal display device, the method comprising joining a first panel having a common electrode, and a second panel having a thin film transistor, a pixel electrode, a gate pad and source pad so as to be spaced from each other, and injecting a liquid crystal material between the first and second panels, the gate pad and the source pad being spaced apart from an edge of the first panel by a predetermined distance.

2. The method as claimed in claim 1, wherein the common electrode is formed on the entire surface of the first panel, and the gate pad and the source pad are spaced apart from an edge of the common electrode by a predetermined distance.

3. A liquid crystal display device comprising:

a first panel having a common electrode on its entire surface; and

a second panel joined to the first panel and spaced from the first panel, the second panel having a gate pad and a source pad which are spaced apart from an edge of the first panel by a predetermined distance.

4. The liquid crystal display device as claimed in claim 3, further comprising:

a gate line connected to the gate pad;

a source line connected to the source pad;

a thin film transistor having a gate electrode extending from the gate line, a source electrode extending from the source line, and a drain electrode facing the source electrode; and

a pixel electrode connected to the drain electrode.

ABSTRACTS

[Abstract]

The present invention provides a structure of a liquid crystal display device including a upper substrate having a common electrode, and a lower substrate having a gate pad and a source pad, in which an edge of the common electrode and the pads are not overlapped, and a method for manufacturing the same. The present invention provides an active panel of the liquid crystal display in which the gate pad and the source pad disposed on the active panel are spaced apart from an edge of a color filter panel by a predetermined distance D. As a result, the gate pad and the source pad are not spatially overlapped the common electrode of the color filter panel, thereby preventing electric short between the common electrode and the pads caused by a remaining conductive material which is left behind after cutting the color filter panel.

[Representative drawing]

Fig. 4d

Fig. 1

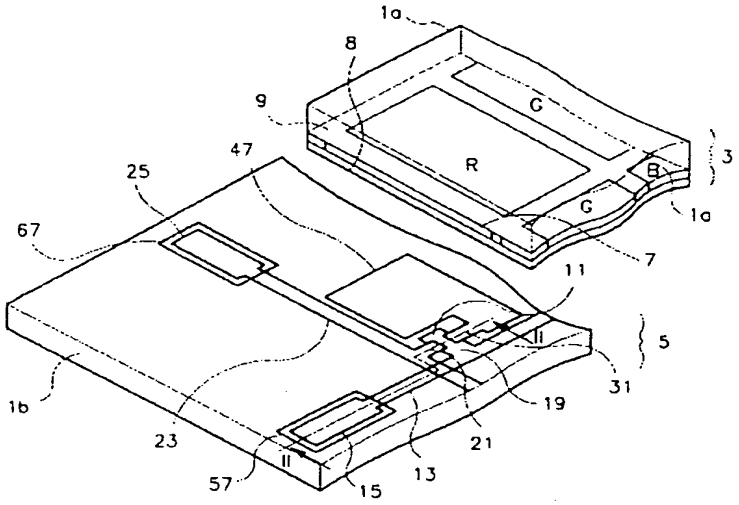

Fig. 2

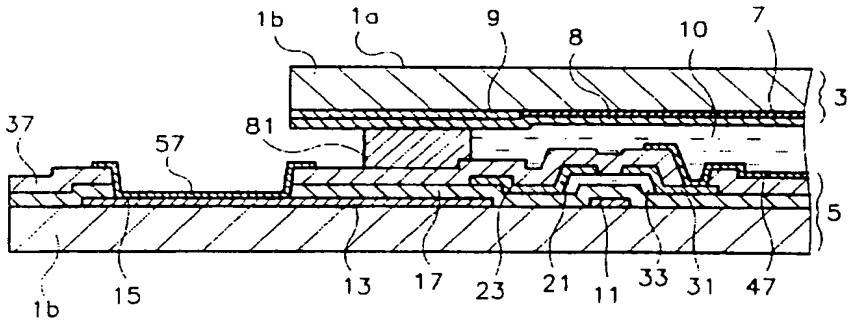

Fig. 3

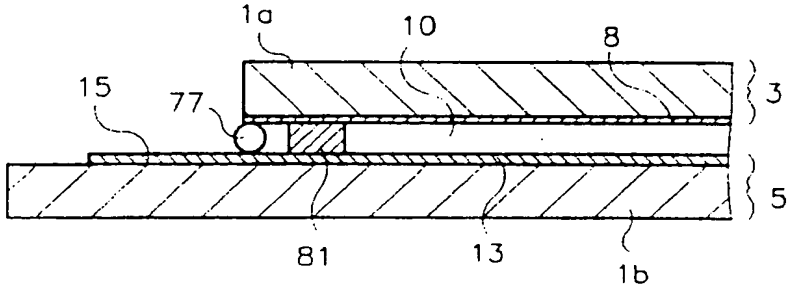

Fig. 4a

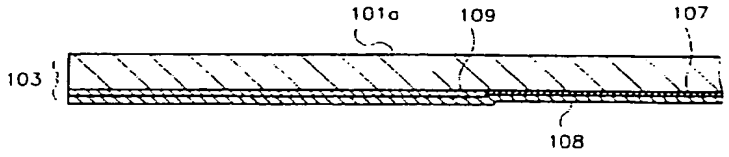

Fig. 4b

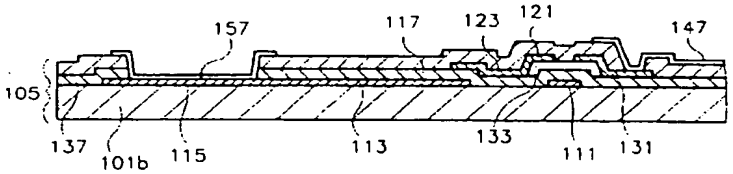

Fig. 4c

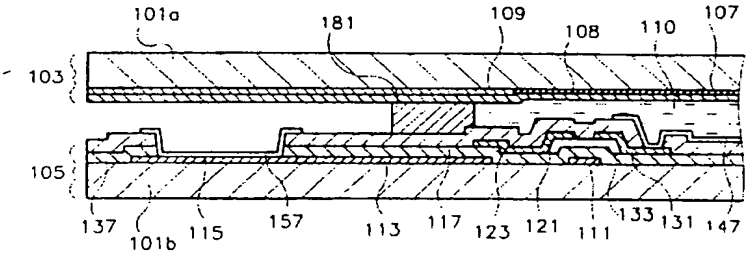

Fig. 4d